Servo Motor Control Using Variable Frequency Drive

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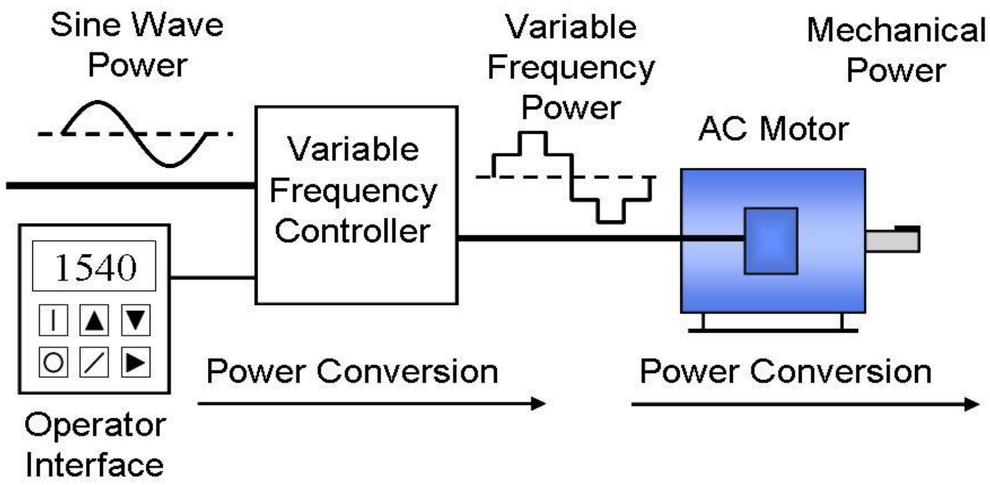
Introduction

Variable Frequency Drive (VFD) refers to an adjustable-speed drive where alternating current electric motor can be controlled by changing the values of frequency and voltage. This process allows the motor to change its torque and speed, depending on the need or demand from the user. VFD is used in many different applications, ranging from small to big, while preserving all other relevant advantages. Some of these advantages that come with using VFD are better process control and regulation, extended equipment life, and reduced maintenance. The components of VFD are converter, DC bus, and inverter. We successfully integrated VFD with Programmable Logic Controller (PLC) using sequencer Instruction to have a complete control over the AC servomotor, and operate motor with change in frequency of VFD. In this poster, we will examine what VFDs are and their applications. The outcome has market demand, especially that VFD applications contribute significantly to different industries.

VFDs

A variable-frequency drive (VFD is a system for controlling the rotational speed of an Alternating Current (AC) of Electric motor by controlling frequency of the electrical power supplied to the motor. VFDs are used in applications ranging from small appliances to large compressors. About 25% of the world's electrical energy is consumed by electric motors in industrial applications, which can be more efficient when using VFDs in centrifugal load service.



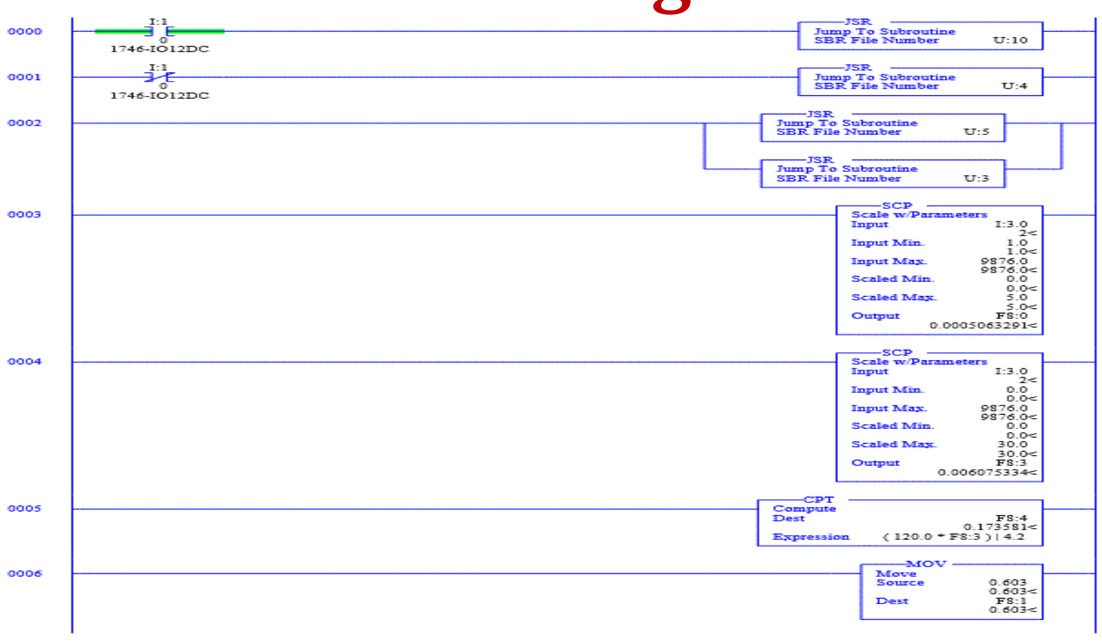
Applications of VFDs

- Variable Speed Operation
- On Booster Pumps
- In pharmaceutical industry
- In oil and gas industry
- For Variable Air Volume system
- Energy savings
- Centrifugal Pump
- Variable Air Volume System

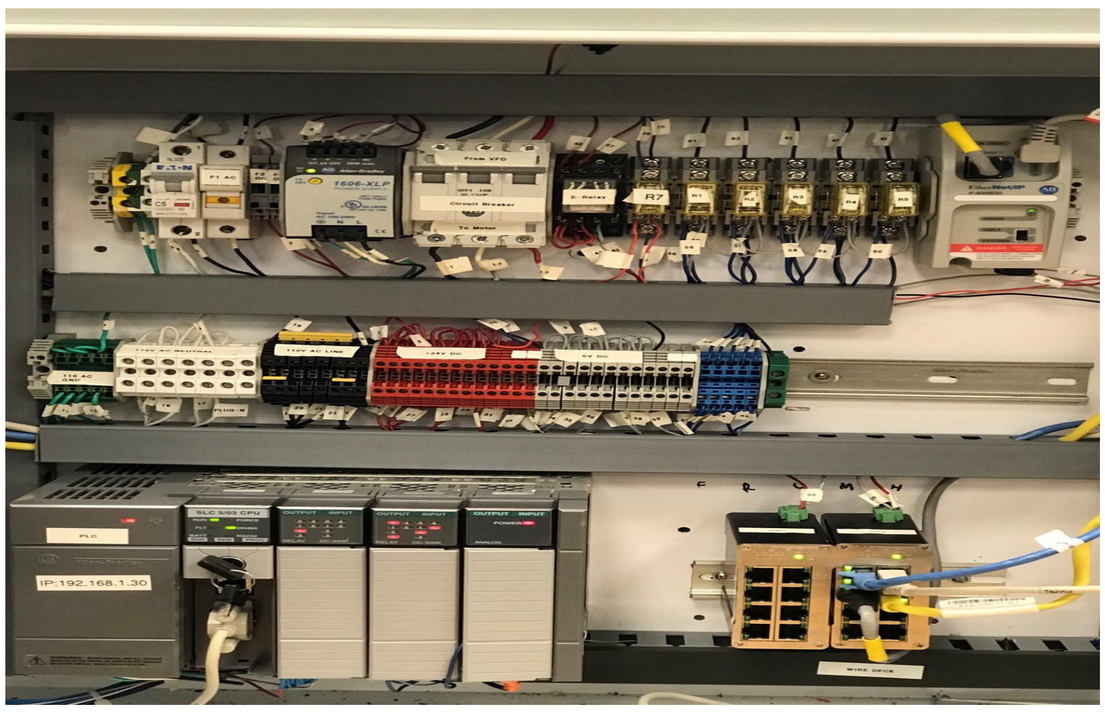
Operation

By selecting the proper settings on VFD, push buttons on the panel can be used to operate the servo motor in forward and reverse direction with low, medium and high speeds and also it can be controlled in forward or reverse jog mode.

Ladder Logic



Overall Cabinet



Hardware Requirements

- Allen Bradley SLC 503 PLC
- Mitsubishi VFD S500
- Allen Bradley power supply
- Ethernet Switch
- Push-buttons

Conclusion and Future Aspects

The variable frequency drive (VFD) has been integrated to the Allen Bradley PLC and the speed of a three phase motor is controlled. The three phases of the motor can be chosen by the user, depending if the user wants low speed, medium speed or high speed. We used RSLOGIX 5000 to program the integration of the VFD and the PLC, this allows us to set the inputs, outputs and operations of the VFD/PLC system. There are many different applications of VFD that range from swimming pool filtration systems to pharmaceutical applications. VFD is a growing field and so is PLC as both these fields grow we could see even more implementations of both systems which could yield even greater results. In future, it can be controlled by using wireless technologies such as Ethernet. In this way it helps to stay connected to the system no matter where you are.

References

- Allen Bradley SLC 500 manual
- https://www.wolfautomation.com/blog/phase-converters-vs-vfds/